WHAT IS CLAIMED IS:

1. An output port circuit of a router apparatus for routing and transmitting a packet received through an input port circuit to each of adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of continuous packets and belonging to either one of a bandwidth-guaranteed class and a best-effort class, said output port circuit comprising:

a storage unit for temporarily storing a packet to be transmitted; and

a controller for controlling storage and reading out of the packet into and from said storage unit,

wherein upon allocating a basic volume that is a criterion of a memory size which can be stored in said storage unit to each of the flows to which the packet to be transmitted belongs, said controller manages the basic volume of each flow of the packet belonging to the bandwidth-guaranteed class by individually allocating the basic volume by as much as the memory size required by each of the flows, and manages the basic volume of each of the flows of the packets belonging to the best-effort class by collectively allocating the memory size obtained by subtracting a sum of each the basic volume allocated to said bandwidth-guaranteed class from an entire memory size of said storage unit.

2. The output port circuit as claimed in claim 1,

wherein said controller calculates a product of a priority and a number of flows belonging to a class for the each best-effort class, calculates a total priority of the best-effort class by calculating a sum of each the product for the number of best-effort classes, calculates a basic

volume allocation ratio for the received packet by dividing the priority of the class to which the flow of the received packet belongs by said calculated total priority, and calculates the basic volume of the flow of the received packet by calculating the product of said calculated basic volume allocation ratio and the basic volume of the best-effort class.

3. An output port circuit of a router apparatus for routing and transmitting a packet received through an input port circuit to each of adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of continuous packets and belonging to either one of a bandwidth-guaranteed class and a best-effort class, said output port circuit comprising:

a storage unit for temporarily storing a packet to be transmitted; and

a controller for controlling storage and reading out of the packet into and from said storage unit,

wherein said controller allocates a basic volume that is a criterion of a memory size which can be stored in said storage unit to each of the flows to which the packet to be transmitted belongs, calculates an excessively used volume of the packet to be transmitted relative to the basic volume of the flow based on an actual used volume of each of the flows by which the flow uses the storage unit, and manages (a) flow information on only the flow that most excessively uses said storage unit relative to said basic volume and (b) the excessively used volume thereof, and

wherein upon receiving a packet belonging to a flow having an excessively used volume larger than the managed excessively used volume, said controller updates (a) the flow information and (b) the excessively used volume to (a) flow information on the flow to which the received packet

belongs and (b) the excessively used volume of the flow thereof.

4. The output port circuit as claimed in claim 3,

wherein upon transmission of a packet belonging to a flow that most excessively uses the storage unit relative to the allocated basic volume from the router apparatus, said controller updates only the managed excessively used volume to the excessively used volume after transmission of the flow.

5. The output port circuit as claimed in claim 1,

wherein said controller calculates an excessively used volume relative to the basic volume of the flow of the packet to be transmitted based on an actual used volume of the flow by which the flow uses the storage unit, and manages (a) flow information on only the flow that most excessively uses said storage unit relative to said basic volume and (b) the excessively used volume thereof, and

wherein upon receiving a packet belonging to a flow and having an excessively used volume larger than the managed excessively used volume occurs, said controller updates (a) the flow information and (b) the excessively used volume to (a) flow information on the flow to which the newly received packet belongs and (b) the excessively used volume thereof.

6. The output port circuit as claimed in claim 5,

wherein upon transmission of a packet belonging to a flow that most excessively uses the storage unit relative to the allocated basic volume from the router apparatus, said controller updates only said managed excessively used volume to the excessively used volume after transmission of the flow.

7. An output port circuit of a router apparatus for routing and transmitting a packet received through an input port circuit to each of

adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of continuous packets and belonging to either one of a bandwidth-guaranteed class and a best-effort class, said output port circuit comprising:

a storage unit for temporarily storing a packet to be transmitted; and

a controller for controlling storage and reading out of the packet into and from said storage unit,

wherein said controller further comprises a first management table memory that stores flow information on a flow to be transmitted next to the flow for each of the flows to manage a flow transmission order upon storing a plurality of flows in said storage unit, and said controller updates said first management table memory so as to designate an order of a new flow to be transmitted next to the flow before said currently transmitted flow upon storing the new flow to be transmitted in said storage unit.

8. The output port circuit as claimed in claim 1,

wherein said controller further comprises a first management table memory that stores flow information on a flow to be transmitted next to the flow for each of the flows to manage a flow transmission order upon storing a plurality of flows in said storage unit, and said controller updates said first management table memory so as to designate an order of a new flow to be transmitted next to the flow before said currently transmitted flow upon storing the new flow to be transmitted in said storage unit.

9. An output port circuit of a router apparatus for routing and transmitting a packet received through an input port circuit to each of adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of continuous packets and

belonging to either one of a bandwidth-guaranteed class and a best-effort class, said output port circuit comprising:

a storage unit for temporarily storing a packet to be transmitted; and

a controller for controlling storage and reading out of the packet into and from said storage unit,

wherein said storage unit is divided to a plurality of blocks each having a predetermined block length, and said controller further comprises a second management table memory that stores information on one of the blocks which stores the packet and information on the other one of the blocks to be connected next to the block that stores the packet while making these information correspond to each other, thereby managing a packet connection state of each of the flows.

10. The output port circuit as claimed in claim 1,

wherein said storage unit is divided to a plurality of blocks each having a predetermined block length, and said controller further comprises a second management table memory that stores information on one of the blocks which stores the packet and information on the other one of the blocks to be connected next to the block that stores the packet while making these information correspond to each other, thereby managing a packet connection state of each of the flows.

11. A router apparatus for routing and transmitting a packet received through an input port circuit to each of adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of continuous packets and belonging to either one of a bandwidth-guaranteed class and a best-effort class, said router apparatus comprising said output port circuit, said output port circuit

comprising:

a storage unit for temporarily storing a packet to be transmitted; and

a controller for controlling storage and reading out of the packet into and from said storage unit,

wherein upon allocating a basic volume that is a criterion of a memory size which can be stored in said storage unit to each of the flows to which the packet to be transmitted belongs, said controller manages the basic volume of each flow of the packet belonging to the bandwidth-guaranteed class by individually allocating the basic volume by as much as the memory size required by each of the flows, and manages the basic volume of each of the flows of the packets belonging to the best-effort class by collectively allocating the memory size obtained by subtracting a sum of each the basic volume allocated to said bandwidth-guaranteed class from an entire memory size of said storage unit.

12. A router apparatus for routing and transmitting a packet received through an input port circuit to each of adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of continuous packets and belonging to either one of a bandwidth-guaranteed class and a best-effort class, said router apparatus comprising said output port circuit, said output port circuit comprising:

a storage unit for temporarily storing a packet to be transmitted; and

a controller for controlling storage and reading out of the packet into and from said storage unit,

wherein said controller allocates a basic volume that is a criterion of

a memory size which can be stored in said storage unit to each of the flows to which the packet to be transmitted belongs, calculates an excessively used volume of the packet to be transmitted relative to the basic volume of the flow based on an actual used volume of each of the flows by which the flow uses the storage unit, and manages (a) flow information on only the flow that most excessively uses said storage unit relative to said basic volume and (b) the excessively used volume thereof, and

wherein upon receiving a packet belonging to a flow having an excessively used volume larger than the managed excessively used volume, said controller updates (a) the flow information and (b) the excessively used volume to (a) flow information on the flow to which the received packet belongs and (b) the excessively used volume of the flow thereof.

13. A router apparatus for routing and transmitting a packet received through an input port circuit to each of adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of continuous packets and belonging to either one of a bandwidth-guaranteed class and a best-effort class, said router apparatus comprising said output port circuit, said output port circuit comprising:

a storage unit for temporarily storing a packet to be transmitted; and

a controller for controlling storage and reading out of the packet into and from said storage unit,

wherein said controller further comprises a first management table memory that stores flow information on a flow to be transmitted next to the flow for each of the flows to manage a flow transmission order upon storing a plurality of flows in said storage unit, and said controller updates said

first management table memory so as to designate an order of a new flow to be transmitted next to the flow before said currently transmitted flow upon storing the new flow to be transmitted in said storage unit.

14. A router apparatus for routing and transmitting a packet received through an input port circuit to each of adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of continuous packets and belonging to either one of a bandwidth-guaranteed class and a best-effort class, said router apparatus comprising said output port circuit, said output port circuit comprising:

a storage unit for temporarily storing a packet to be transmitted; and

a controller for controlling storage and reading out of the packet into and from said storage unit,

wherein said storage unit is divided to a plurality of blocks each having a predetermined block length, and said controller further comprises a second management table memory that stores information on one of the blocks which stores the packet and information on the other one of the blocks to be connected next to the block that stores the packet while making these information correspond to each other, thereby managing a packet connection state of each of the flows.

15. A method of controlling an output port circuit of a router apparatus for routing and transmitting a packet received through an input port circuit to each of adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of continuous packets and belonging to either one of a bandwidth-guaranteed class and a best-effort class, said method including the following steps of:

temporarily storing in a storage unit a packet to be transmitted; and

controlling storage and reading out of the packet into and from said storage unit,

wherein upon allocating a basic volume that is a criterion of a memory size which can be stored in said storage unit to each of the flows to which the packet to be transmitted belongs, said controlling step includes steps of managing the basic volume of each flow of the packet belonging to the bandwidth-guaranteed class by individually allocating the basic volume by as much as the memory size required by each of the flows, and managing the basic volume of each of the flows of the packets belonging to the best-effort class by collectively allocating the memory size obtained by subtracting a sum of each the basic volume allocated to said bandwidth-guaranteed class from an entire memory size of said storage unit.

16. The method as claimed in claim 15,

wherein said controlling step includes steps of calculating a product of a priority and a number of flows belonging to a class for the each best-effort class, calculating a total priority of the best-effort class by calculating a sum of each the product for the number of best-effort classes, calculating a basic volume allocation ratio for the received packet by dividing the priority of the class to which the flow of the received packet belongs by said calculated total priority, and calculating the basic volume of the flow of the received packet by calculating the product of said calculated basic volume allocation ratio and the basic volume of the best-effort class.

17. A method of controlling an output port circuit of a router

apparatus for routing and transmitting a packet received through an input port circuit to each of adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of continuous packets and belonging to either one of a bandwidth-guaranteed class and a best-effort class, said method including the following steps of:

temporarily storing in a storage unit a packet to be transmitted; and

controlling storage and reading out of the packet into and from said storage unit,

wherein said controlling step includes steps of allocating a basic volume that is a criterion of a memory size which can be stored in said storage unit to each of the flows to which the packet to be transmitted belongs, calculating an excessively used volume of the packet to be transmitted relative to the basic volume of the flow based on an actual used volume of each of the flows by which the flow uses the storage unit, and managing (a) flow information on only the flow that most excessively uses said storage unit relative to said basic volume and (b) the excessively used volume thereof, and

wherein upon receiving a packet belonging to a flow having an excessively used volume larger than the managed excessively used volume, said controlling step further includes a step of updating (a) the flow information and (b) the excessively used volume to (a) flow information on the flow to which the received packet belongs and (b) the excessively used volume of the flow thereof.

18. The method as claimed in claim 17,

wherein upon transmission of a packet belonging to a flow that most excessively uses the storage unit relative to the allocated basic volume from

the router apparatus, said controlling step further includes a step of updating only the managed excessively used volume to the excessively used volume after transmission of the flow.

19. The method as claimed in claim 15,

wherein said controlling step further includes steps of calculating an excessively used volume relative to the basic volume of the flow of the packet to be transmitted based on an actual used volume of the flow by which the flow uses the storage unit, and managing (a) flow information on only the flow that most excessively uses said storage unit relative to said basic volume and (b) the excessively used volume thereof, and

wherein upon receiving a packet belonging to a flow and having an excessively used volume larger than the managed excessively used volume occurs, said controlling step further includes a step of updating (a) the flow information and (b) the excessively used volume to (a) flow information on the flow to which the newly received packet belongs and (b) the excessively used volume thereof.

20. The method as claimed in claim 19,

wherein upon transmission of a packet belonging to a flow that most excessively uses the storage unit relative to the allocated basic volume from the router apparatus, said controlling step further includes a step of updating only said managed excessively used volume to the excessively used volume after transmission of the flow.

21. A method of controlling an output port circuit of a router apparatus for routing and transmitting a packet received through an input port circuit to each of adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of

continuous packets and belonging to either one of a bandwidth-guaranteed class and a best-effort class, said method including the following steps of:

temporarily storing in a storage unit a packet to be transmitted; and

controlling storage and reading out of the packet into and from said storage unit,

wherein said output port circuit further comprises a first management table memory that stores flow information on a flow to be transmitted next to the flow for each of the flows to manage a flow transmission order upon storing a plurality of flows in said storage unit, and

wherein said controlling step further includes a step of updating said first management table memory so as to designate an order of a new flow to be transmitted next to the flow before said currently transmitted flow upon storing the new flow to be transmitted in said storage unit.

22. The output port circuit as claimed in claim 15,

wherein said output port circuit further comprises a first management table memory that stores flow information on a flow to be transmitted next to the flow for each of the flows to manage a flow transmission order upon storing a plurality of flows in said storage unit, and

wherein said controlling step further includes a step of updating said first management table memory so as to designate an order of a new flow to be transmitted next to the flow before said currently transmitted flow upon storing the new flow to be transmitted in said storage unit.

23. A method of controlling an output port circuit of a router apparatus for routing and transmitting a packet received through an input

port circuit to each of adjacent nodes through the output port circuit by a switch fabric circuit, each of flows being constituted by a plurality of continuous packets and belonging to either one of a bandwidth-guaranteed class and a best-effort class, said method including the following steps of:

temporarily storing in a storage unit a packet to be transmitted; and

controlling storage and reading out of the packet into and from said storage means,

wherein said storage unit is divided to a plurality of blocks each having a predetermined block length,

wherein said output port circuit further comprises a second management table memory that stores information on one of the blocks which stores the packet and information on the other one of the blocks to be connected next to the block that stores the packet while making these information correspond to each other, said controlling step further including a step of managing a packet connection state of each of the flows.